SEPSIS PERFORMANCE IMPROVEMENT
Using Simulation to Accelerate Adoption of Evidence-Based Sepsis Protocols
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2015 Recipient of the Sepsis Alliance’s
“Nurses Who Know Sepsis” Award
Medical Simulation Corporation is a healthcare performance improvement company, advancing clinical quality and patient safety. We solve your most costly and complex problems, like sepsis.
Objective 1: Describe healthcare burden of sepsis.

Objective 2: Explain importance of approaching sepsis performance improvements measures using a team-based approach.

Objective 3: Compare Surviving Sepsis Campaign Guidelines to CMS Core Measures for Sepsis.

Objective 4: Analyze outcomes of simulation-based sepsis performance improvement initiatives.
WHAT IS SEPSIS? INTRODUCTION

Definition

- **Sepsis** - a syndrome causing life-threatening organ dysfunction due to a dysregulated host response to an infection. (Sepsis Definitions Task Force)

- **The challenge** - There is no single characteristic that identifies septic patients.
STOP SEPSIS. SAVE LIVES.
WHY IS SEPSIS PI IMPORTANT?

HOSPITAL CONTINUUM OF CARE

ED/Admission → Diagnosis → Pre Op → Procedure → Recovery / ICU → Floor → Discharge

Sepsis
WHY IS SEPSIS PI IMPORTANT?

- Sepsis: responsible for 1 in every 2-3 in hospital deaths and the majority of these patients had sepsis upon presentation to the hospital. ³

  - Septic shock kills approximately 7x as many surgical patients as MI and PE COMBINED²

  - **Hospital Acquired-SS**
    - Mortality Rate 19.2%
    - LOS – 17 Days

  - **Healthcare Associated-SS**
    - Mortality Rate 12.8%
    - LOS – 7 Days

  - **Community Acquired-SS**
    - Mortality Rate 8.6%
    - LOS – 6 Days
WHY IS SEPSIS PI IMPORTANT?

READMISSIONS

- Sepsis is the highest condition driving readmissions\(^1\) and a leading contributor of healthcare costs.\(^2\)

- 40% of sepsis patients are readmitted in 3 months.\(^3\)
  - The most common cause was infection related, accounting for 46% of all 30-day readmissions.\(^8\)

- 75% of rehospitalizations may be avoidable.
  - Contributes to over $10 billion in excess healthcare costs for Medicare patients alone.\(^4\)
WHY IS SEPSIS PI IMPORTANT?

POST SEPSIS SYNDROME
• People who survive sepsis are more likely to experience permanent organ damage, and cognitive impairment, decreased quality of life and increased long-term mortality\textsuperscript{5,9}
  
  ❖ Up to 50% of sepsis survivors suffer from post sepsis syndrome
  
  ❖ 74% of sepsis survivors experience functional disabilities 3 years out\textsuperscript{6,7}
ELEMENTS OF A SUCCESSFUL SEPSIS INITIATIVE

1. **Formalize Identification** – Develop screening tools/alerts
   ✔ *Defined sepsis processes* that coordinate the roles of the care team to deliver *timely treatment* for every patient, every time

2. **Accelerate Treatment** – Train and empower nurses to start bundles after identification in order to meet time goals

3. **Globalize Prevention** – Expand care efforts across health systems
   ✔ Engage frontline clinicians to identify and address process breakdowns
   ✔ Foster a *culture of accountability* for sepsis protocol adherence

Advisory Board Company – Crimson Continuum of Care and Physician Executive Council
Optimal Sepsis Care Requires a Defined, Team Approach

- Sepsis failures rarely can be traced back to a single provider. The culprit is typically a *system breakdown*.

Sepsis Program Rollout Should Start in the ED

- 60 - 80% of sepsis patients present to the ED

A Sepsis Initiative Should Ingrain Sustainable Behaviors

- Accountability

Continuous Learning Environment & Outcome Measurement
FIRST STEP - RECOGNITION

HOWARD W. COOPER
1986 - 2015
"I TOLD YOU I WAS SICK"
RECOGNITION

- Extremes of Age – < 10 and > 70 years old
- **Chronic illnesses [Co-morbidities]**
- Compromised immune system
- Recent prior broad spectrum antibiotic use
- Exposure to infectious trigger associated with invasive procedure
- Major surgery, trauma or burns
- Prolonged hospitalization
- Other factors such as childbirth, abortion, and malnutrition
The Surviving Sepsis Campaign Care Bundle (Resuscitation) is comprised of evidence-based goals targeted for completion within 6 hours (of identification) for patients with severe sepsis and septic shock. Initial resuscitation strategies focus on stabilizing the patient.

**Efforts are directed toward:**

- Increasing preload
- Normalizing lactate
- Reversing hypoperfusion
- Increasing oxygen-carrying capacity
- Promoting adequate cardiac contractility
PROTOCOLS - WHICH ONES?

BUILDING BLOCKS OF REVISED SSC GUIDELINES - The trials


• Lactate clearance vs central venous oxygen saturation - Jones, A. et al. (2010). Published in Jama, 303(8), 739-746.

• ProCESS – (Protocol-Based Care for Early Septic Shock)¹ published March 18, 2014 in NEJM

• ARISE – Australasian Resuscitation in Sepsis Evaluation Published October 1, 2014 in NEJM DOI: 10.1056/NEJMoa1404380

• PRoMISE – The PRotocolised MAnagement In Sepsis Published April 2, 2015 in NEJM DOI: 10.1056/NEJMoa1500896
Complete within 3 hours:

☑ Measure serum lactate.

☑ Obtain two or more blood cultures prior to antibiotic initiation unless unable to obtain within the allowed time dictated. (A reasonable attempt should be made.)

☑ Administer broad spectrum antibiotic.

☑ Administer 30 mL/kg crystalloid for hypotension or lactate ≥ 4 mmol/L.
Complete within 6 hours:

- Apply **vasopressors** (for hypotension that does not respond to initial fluid resuscitation) to maintain a mean arterial pressure (MAP) ≥ 65 mmHg.

- In the event of persistent hypotension after initial fluid administration (MAP < 65 mm Hg) or if initial lactate was ≥4 mmol/L, **re-assess volume status** and tissue perfusion and document findings according to Table 1.

- Re-measure lactate if initial lactate elevated.
SSC TABLE 1

DOCUMENT REASSESSMENT OF VOLUME STATUS AND TISSUE PERFUSION WITH:

EITHER
• Repeat focused exam (after initial fluid resuscitation) by licensed independent practitioner including:
  ✓ Vital signs
  ✓ Cardiopulmonary
  ✓ Capillary refill, pulse, and skin findings

OR TWO OF THE FOLLOWING:
• Measure CVP
• Measure ScvO2
• Bedside cardiovascular ultrasound
• Dynamic assessment of fluid responsiveness with passive leg raise or fluid challenge

http://www.survivingsepsis.org/Bundles/Pages/default.aspx
The Centers for Medicare & Medicaid Services has notified hospitals participating in the inpatient quality reporting program that data collection of the Severe Sepsis and Septic Shock: Management Bundle measure (NQF #0500) will begin with discharges on or after **Oct. 1, 2015**.

The measure was adopted for the fiscal year **(FY) 2017 payment** determination in the FY 2015 inpatient prospective payment system final rule.

[Download the Specifications Manual for National Hospital Inpatient Quality Measures v.5.0](#)
Complete within 3 hours of **Time or Presentation**† of Severe Sepsis:

- Measure serum lactate.
- Obtain **blood cultures** prior to antibiotic initiation.
- Administer **broad spectrum antibiotic**.

Complete within 6 hours of Severe Sepsis:

- Re-measure lactate if initial lactate elevated.
**SEP-1 TIME ZERO**

- Earliest chart annotation that suggests signs and symptoms of severe sepsis are all present.
- Chart Annotation may include ANY of the following:
  - Nursing charting
  - Lab flow sheets
  - Physician documentation
  - Anything with a time stamp

****Time Zero WILL equal Triage time ONLY if all signs and/or symptoms are present at triage****
SEP-1 – SEPTIC SHOCK

Complete within 3 hours of Presentation of Septic Shock:
✓ Resuscitation with 30 mL/kg crystalloid fluids
   
   **AND ONLY** If hypotension persists

Complete within 6 hours of Presentation of Septic Shock
✓ Vasopressor administration
   
   **AND ONLY** If hypotension persists after fluids OR initial lactate $\geq 4$ mmol/L

✓ Repeat volume status and tissue perfusion assessment
BENEFITS OF SIMULATION

Traditional Staff Education
BENEFITS OF SIMULATION

Retention of Knowledge

- Teach Others 90%
- **Learn By Doing (Simulation)** 75%
- Discussion (Web Seminar, IM) 50%
- Demonstration (*Animation*) 30%
- Audio-Visual/PowerPoint 20%
- Lecture/Streaming Media 5%

Principles of Effective Simulation

- Assess needs *first*

- Must be carefully integrated with other educational events\(^5\)

- “Authenticity should have a high priority when programs for the assessment of professional competence are being designed.”
BENEFITS OF SIMULATION

- Accelerates knowledge transfer\(^1\)\(^-\)\(^3\)
- Allows concentration on specific skills and knowledge
- Involves participants in clinically challenging situations
- Improves functioning as a team
"The plane turned into a boat, mommy!"

Child on flight US Air 1529 after the plane she was flying in landed in the Hudson River.

Ask any passenger on the flight if simulation is effective – if it works to save lives...
IMMERSE COMPONENTS

MSC utilizes the most recent technology to evaluate competency, deliver education, and simulate critical care scenarios.

Knowledge Assessments
Online Education
Immersive Simulation
Team Training
Data and Analytics
HASC 2015 PARTICIPATION

Clinical Role Demographics

- ED RN: 50, 30%
- Med-Surg/Tele: 17, 10%
- ICU RN: 36, 22%
- Educators/Coordinators/Directors: 42, 26%
- MD: 3, 2%
- RT: 16, 10%
Participants demonstrated a *28% increase* in knowledge from the knowledge check to the simulation post-test. Additionally, the *standard decreased 29%* across participant scores.
HCNCC SEPSIS TRAINING 2014

CLINICAL ROLES

- ED RN: 70, 31%
- Med-Surg RN: 60, 27%
- ICU RN: 48, 21%
- RT: 17, 8%
- Supervisor: 20, 9%
- MD: 8, 4%

Key - Number of participants/ % of total participants
HCNCC SEPSIS TRAINING 2014

Aggregate Knowledge Gain

**Knowledge Check**

- **Mean = 65%**

**Simulation Post-Test**

- **Mean = 85%**
“My index of suspicion for sepsis will be increased and I will be more readily able to treat patients within the 'golden hour' using increased fluid boluses and starting with (antibiotics) in a more timely manner.”

~ Sepsis Program Participant, MD

“This was a very concise and excellent simulation. I enjoyed both the presentation and hands on aspects. It was surprising how much was learned in such a short time. I would highly recommend this course and would look forward to advanced training. The main take away was not to withhold aggressive fluid resuscitation.

~ Sepsis Program Participant, PA
Compliance with Three-Hour Bundle

- Measure serum lactate within 3 hours: Before 53%, After 83%
- Collect blood cultures prior to administration of antibiotics: Before 94%, After 85%
- Administer broad-spectrum antibiotics within 1 hour: Before 29%, After 6%
- Administer broad-spectrum antibiotics within 3 hours: Before 61%, After 78%
- Administer 30 ml/kg crystalloid solution (hypotension, lactate): Before 21%, After 36%

Measure serum lactate within 3 hours
Collect blood cultures prior to administration of antibiotics
Administer broad-spectrum antibiotics within 1 hour
Administer broad-spectrum antibiotics within 3 hours
Administer 30 ml/kg crystalloid solution (hypotension, lactate)
Compliance with Six-Hour Bundle

- Vasopressors if needed after fluid bolus failed to maintain MAP ≥ 65 within 6 hours: 62% improvement from 38%
- CVP measured if shock or lactate ≥ 4 within 6 hours: 12% before compared to 38% after
- ScvO2/SvO2 measured if shock or lactate ≥ 4 within 6 hours: 0% before compared to 25% after
- Re-measure lactate if initial lactate > 2 within 6 hours: 12% before compared to 25% after

Before (n = 149) vs. After (n = 36)
In this example, very good clinical delivery was associated with a 3% mortality rate.
**HOW WE KNOW IT WORKS**

**RESULT:** MSC and California Hospital Association reduced sepsis mortality in 49 hospitals by 26%.

The effort contributed to a cost avoidance of $64 million from 2010 to 2012. MSC also trained almost 3,600 staff in 129 hospitals.

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**RESULT:** Dignity Health and MSC partner to achieve a stunning $69 million cost reduction over 6 years.

Collaboration also resulted in a 73% reduction in mortality.

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**Community Hospital of the Monterey Peninsula**

**RESULT:** CHOMP has achieved steady reduction in mortality, from 30% to 17%.

CHOMP has relied on MSC for four consecutive years to provide immersive simulation training for both adults and pediatrics.

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**RESULT:** MSC and Cape Regional Medical Center reduce sepsis costs by 31% and mortality by 15%.

Partnership also resulted in a 200% increase in compliance with the evidence-based guidelines of the Surviving Sepsis Campaign.
CONCLUSION PERFORMANCE IMPROVEMENT TAKES TIME

- Improved Compliance
  - ~ 3 yr: 10.9% → 31.3%
- Improved Mortality
  - ~ 3 yr: 37% → 30.8%
  - Greatest ↓at 3 year sites
